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THE
COMMERCIAL PRODUCTS
OF THE
CITRUS FAMILY.

BY
CHARLES RICE.



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THE CITRUS FAMILY.

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ALTHOUGH there is no lack of numerous and excellent descriptions of the various members of the Citrus family, yet there exists no single work of reference which gives, in a condensed manner, anything like a complete survey of the usual commercial products derived from the family, so that it is often necessary to consult a large number of works before the desired information is gained. In the course of such a search it will also be noticed that the different authors make many confusing and even positively contradictory statements, so that it requires considerable labor to get at the exact facts. A concise synopsis of these commercial products, giving their origin, history, and use, will therefore be of sufficient usefulness and interest to warrant its publication. In order to save space, however, all botanical descriptions will be omitted, and only those species will be cited which yield products in-

teresting to the pharmacist and physician ; namely, the following :

Citrus vulgaris Risso—The Bitter Orange.

Citrus Aurantium Risso—The Sweet Orange.

Citrus Limonum Risso—The Lemon.

*Citrus Limetta** Risso—The Lime.

*Citrus Bergamia** var. *vulgaris* R. The Bergamot.

Citrus medica Risso—The Citron.

Citrus Pompelmos Risso—The Shaddock.

I. THE BITTER ORANGE.

Citrus Vulgaris Risso (*C. Bigaradia*¹ Duhamel ; *C. Aurantium*² var. α *amara* L.). *Habitat* :

¹ The derivation of this word is somewhat uncertain. *Ménage*, in his *Dictionnaire Etymol. de la Langue Fr.*, derives it and all its congeners from the Latin *bis varius* "twice-differing," namely by *shape* and by *color* ; but this is far-fetched. It is probably the same as *bizarre*, for it is called by this name by several old writers (see *Risso*) ; and this is originally a Basque word, *bizarra* "beard," which by long migration has finally reached the seemingly anomalous meaning "queer, capricious ;" see *Müller, Etym. Wört. d. Engl. Spr.* 90.

² *Aurantium* has nothing in common with the Latin *aurum* "gold." Its true origin has long been shown to be the Arabic *nârandj*. This latter word was brought to Europe by the Moors, whence the Spanish *naranja* and Portuguese *laranja*. Then it became, in Italian, *arancio*, and in Mediævo-Latin, *arangia*, *arangius*, *arantia*, (*malus*) *anarantia*, *nerantium*, etc. Up to the importation of the sweet orange into Europe (ab. 1548 A.D.) all these words denoted the bitter orange. Gesner and Belloni already misunderstood the word, and identified it with *mala aurea* "golden apples." So also Ferrari in his work *Hesperides*,

* The two species are by many botanists regarded merely as varieties of *C. Limonum* Risso.

Northern East Indies, Southern China, and Cochin China. Cultivated in Italy, Portugal, Malta, the Ionian Islands, the Azores, in North Africa, West. Asia, West Indies, etc.

Engl. : Bitter, or Seville, or Bigarade Orange (-tree). *Germ.* Gemeiner or Bitterer Pomeranzenbaum. *French* : Bigaradier. *Ital.* : Arancio amaro. *Span.* : Naranjo ágrío. *Port.* : Laranjeira de fructo azedo or amargo.

The Leaves (1) are about 10 cm. long, somewhat bitter, strongly odorous when rubbed between the fingers ; contain about 0.3 per cent of essential oil. Used in nervous and hysterical affections.

Lat. : Folia Aurantii (Germ. Ph.). *Engl.* : Orange leaves. *Fr.* : Feuilles de Bigaradier. *Germ.* : Pomeranzenblätter, etc.

They yield:

seu de malorum aureorum usu et cultu, Rome, 1646. The Byzantine Greeks made of it the words *νεπαντζιον*, *νεπαντζι*, *νεπαντζέα*. The Arabic *nârandj* is from the Persian *nârendj*. This word, as well as the fruit, is said to have been brought there about 912 A.D. It is the same as Sanskrit *nâranga*, or *nârangî*, which has been supposed to be a contraction of *nâga-ranga* "snake-color (having)." This is, however, an invention of the Hindu etymologists, who were bound to squeeze the word into a frame which would give some sense. The word, no doubt, originated in the old Hindu vernacular, of which we have only traces left. Susruta, whose work was composed at least before 750 A.D., already mentions the word *nârangî*. In the *Madanavino-da* (or *Madana-Pâla-Nighantu*), a Sanskrit medical glossary, composed A.D. 1374 (ed. Calcutta, 1875), we find the word *nâranga* applied to two varieties, one of which may have been the bitter orange or the lemon: "*nâranga* is sour and very sharp ; it removes wind and bile ; another kind is sweetish-sour, pleasant, hard to digest, etc." (vi. 80, p. 70). The latter appears to be the orange ; the former, the lemon.

Essence^a de Petit Grain (2) by distillation with water. The young shoots as well as the leaves, both of the *sweet* and the *bitter* orange, are used for this purpose. Compare **II**.

Acqua di Vette (3) is the Italian name of the water distilled from these leaves and twigs.

The Unexpanded Flowers (4) have a very agreeable odor when fresh ; when dry, they are almost odorless. The commercial flowers are salted. The fresh flowers appear to contain several volatile oils, the finest of which is rather soluble in water ; hence genuine orange flower-water has a finer flavor than the artificial. The finer essence is also obtained by the process of enfleurage or maceration (see **NEW REM.**, 1877, 340).

Lat. : Flores Aurantii ; (the officinal may be derived either from the bitter or the sweet orange). Flores Aurantiæ. Flores Naphæ. *Fr.* : Fleurs de bigaradier (or d'oranger). *Germ.* : Pomeranzenblüthen. *Span.* : Azahar. *Port.* : Flores de Laranjeira.

They yield :

Essence de Nérolí Bigarade (5), by distilling the fresh flowers with water. This is called

Essence de Nérolí Pétale (6), if, previously to the distillation, the flowers are deprived of the calyx. The product is finer, and naturally more expensive.

The commercial oil is chiefly made in Southern France, at Grasse, Cannes, and Nice, where about 20,000 cwt. of the flowers are annually distilled. The *Essence de Nérolí de Paris* (7), which is made about the French capital, is very fine, but is not exported. The petals of the Sweet Orange flower are likewise, at least partly, used in its manu-

^a The French used for these essential oils the term *essence*, instead of *huile* "oil."

facture. Both of the above-mentioned oils are generally adulterated with the essential oil of orange leaf: Essence de Petit Grain (2). The fraud is detected by dropping the oil on sugar, and dissolving this in water. If the latter acquires a bitter taste, the oil was adulterated. More difficult is the detection of oil of bergamot distilled over orange flowers, which is sometimes substituted. According to Flückiger, the oil of neroli commonly sold consists of $\frac{3}{5}$ essence de petit grain (2), $\frac{1}{5}$ essence of bergamot (47), and $\frac{2}{5}$ of true neroli. The pure oil has a brownish hue, showing a violet fluorescence when diluted with alcohol; or, as it is distilled at Nizza, a magnificent blue color, with a red fluorescence (*Flückiger*).

Orange Flower Water (8). This should be prepared from the fresh flowers (U. S.). That prepared from the dry is less fragrant, and that prepared from the essential oil still less so.

Lat.: Aqua Aurantii florum (may be prepared from the flowers of the bitter or sweet orange, U. S., Br., and G. Ph.). Aqua Naphæ (three grades, simplex, duplex, triplex). Aqua Florum Naphæ. *Eng.*: Orange Flower Water. *Fr.*: Eau de Naphé. Eau de Naffe. In Languedoc: Eau de Naphre. *Germ.*: Orangenblüthenwasser. *Ital.*: Acqua Nanpha, corrupt: Lanpha. *Span.*: Agua de Azahar.

The Unripe Fruit ⁴ (9) is, when dry, from the size of a pea to that of a cherry; round, hard, greenish-brown, or grayish-green, the surface wrinkled from the drying up of the oil-cells. The outer peel contains essential oil, the inner white layer, like all the fruits of the Citrus family, bitter hesperidin. Used to flavor liquors and elixirs (one of which is known as Tinctura episcopalis, Bishop's Elixir), and to make issue-peas.

⁴ The Italians comprise all the sour and acid fruits, particularly those of the *Citrus* family, under the name *agrumi*. Agrumi-plantations very generally mean those of the orange, lemon, and citron.

The latter are also made from the unripe sweet orange.

Lat. : Fructus Aurantii immaturi. Aurantia immatura. Baccæ (or poma) Aurantiæ immaturæ (-a). Aurantia Curassoventia. *Engl.* : Orange Peas. Curasso Oranges. *Fr.* : Petits Grains (= "small grains"). Orangettes. *Ital.* : Aranzinetti. *Span.* : Naranjillas. *Germ.* : Unreife Pomeranze.

Curaçao Peel (10). During the 17th and part of the 18th century, the fruits of a variety of bitter orange growing in Curaçao, and probably also in Barbadoes, which remained green even when ripe, were much esteemed. But what is now known in trade as Curaçao peel in Europe is the rind of an *unripe* French bitter orange, or probably the rind of an orange growing near Grimes, having a permanently green peel.

Lat. : Cortex Curaçao. Cortex Aurantiorum Curassaviensis. *Fr.* : Curaçao des Isles or de Hollande ; etc.

Orange Peas yielded once

Essence de Petit Grain or *E. d'Orangettes* (11 ; see 2). Hence the name. This oil has a different flavor from that of the ripe fruit. At present, however, essence de petit grain is made from the leaves and twigs (see above), and is, therefore, a misnomer.

The Ripe Fruit (12) is seldom found whole in the market. It is not eatable, as it is very bitter. The seeds are excessively so.

The market is supplied with bitter oranges (and peel) mostly from Sevilla and Malaga (best quality) in Spain, Oporto, St. Ubes, and Faro in Portugal, from Sicily, and from Genoa, Nizza, and Leghorn. Cuba, Jamaica, and Florida also produce bitter oranges.

Lat. : Fructus Aurantii amari. Malus aurantia. *Engl.* : Bitter, Seville, or Bigarade Orange. *Fr.* : Bigarade.

Germ. : Pomeranze. *Ital.* : Arancio forte, volgare, or amaro.

The Peel of the Ripe Fruit (13) appears, at least in the Continental markets, in spongy, pointed-oval, flat or slightly convex pieces, externally greenish or brownish-red and wrinkled, internally dirty-white, having an aromatic and rather bitter taste. The *Germ. Phar.* directs that, for use, this inner white layer, technically termed *Albedo* ("the whiteness") should be removed by soaking the peel in water, and then taking it off with a knife. The remaining thin yellow skin, constituting about 50 per cent of the weight, is technically called *Flavedo* (14) ("the yellowness"), or more completely

Lat. : Flavedo [corticis] Aurantiorum. Cortex Aurantiorum mundatus or expulpatus.

The workmen who peel the fruits often suffer from eruptions on the hands ; they are also very subject to disturbances of digestion, dizziness, tinnitus aurium, subsultus tendinum, and even epileptiform convulsions.

ORANGE PEEL OF THE AMERICAN MARKET. —There being a good deal of variety, both in appearance and in origin, of the orange peel in our markets, we shall speak of the commercial bitter as well as sweet peel in this place.

1.) *Bitter Orange Peel*, no matter in what shape it occurs, is mainly distinguishable by its strong odor and taste ; when chewed, by the sharp impression it leaves upon the tongue and palate for a considerable time, and by a greater or less degree of bitterness. Some varieties are scarcely at all bitter, but all are, or should

be, rich in volatile oil. Standing near two persons, one of whom is chewing sweet and the other bitter orange peel, it is quite easy to distinguish one from the other. The bitter peel is usually much thicker and becomes harder than the other. In color, the bitter peel is either dark-yellow, or brownish-red, or else more or less green. It occurs in the market in three shapes :

- a) *In Quarters*.—Either *brownish-red* ; from the Sevilla orange, grown in Spain, South France, or West Indies. Most of it reaches our market from Malaga and Jamaica. Or *greenish*. This is the so-called “Curaçao” variety, of French origin, according to *Pharmacographia* and others ; but, as we are informed, also grown in Portugal, and exported from Lisbon.
- b) *In Ribbons (or Shreds)*.—The oranges are, in this case, pared with a knife, like an apple, beginning at the apex, and spirally winding around the body of the fruit. The color of these is *greenish*, but most lots are mixed with *yellowish* ribbons, showing that either several varieties of bitter *ripe* orange have yielded it, or that one and the same variety of orange in different stages of ripeness has been employed.
- c) *In Quarters and Ribbons mixed*.—This is generally of the Malaga variety, that is, the brownish-red Sevilla orange. This kind is held a trifle cheaper than either the quarters or ribbons alone, and is mostly used for cutting and grinding.

2) *Sweet Orange Peel* generally has a light yellow to light brownish-yellow color, is less thick than the bitter, does not become readily hard, is free from bitterness, leaves no sharp impression on the tongue, except a mild aromatic flavor, often accompanied by a distinct sweetness. It always appears in quarters, and is imported from Spain, South France, Italy, the West Indies, Florida, etc. However, many packages of sweet orange peel contain occasionally more or less bitter peel, probably owing to the fact that in some places it would not have paid the growers or dealers to pack the bitter peel in special packages.

We have also found orange peel in this market, of which it was quite difficult to decide whether it came from the bitter or the sweet orange. Inquiries on our side have made it probable, that the method of grafting, in use in some European and West Indian orange-growing districts, has produced varieties of orange, the peel of which somewhat partakes of the properties of both the sweet and the bitter orange.

Lat. : Aurantii amari cortex (U. S.). Cortex fructus Aurantii (G. Ph.). Cortex Aurantiorum or pomorum Aurantii. Pericarpium Aurantii. *Engl.* : Bitter Orange peel. *Fr.* : Ecorces or zestes⁵ d'Oranges amères. *Germ.* : Pomeranzenschalen.

Candied Orange Peel (15) is made by soaking the peel in water, until the bitterness is extracted ; it is then placed into syrup, until it is soft

⁵ The French *zeste* denotes the whole peel or pericarp of the fruit ; the inner white layer or "albedo" is called *ziste*.

and transparent, taken out, drained, and dried. Used as a sweetmeat.

Lat. : Cortex Aurantiorum (or Aurantii) conditus.

*Orangeat*⁶ (16) is the candied peel of a variety of bitter orange, namely *Citrus spatuliformis* Risso.

Lat. : Confectio Aurantiorum. Conditum Aurantiorum.

Essence de Bigarade (17). Prepared from the rind of the scarcely ripe fruit by mechanical means, either by the sponge or the écuelle process,⁷ seldom by distillation. It must not be confounded with the *Essence de Néroli Bigarade*. It is often adulterated with oil of lemon.

Lat. : Oleum Aurantii corticis. *Engl.* : Oil of Bitter Orange-Peel. *Fr.* : Essence de Bigarade. Essence d'Orange (s). *Germ.* : Bittere Pomeranzen[schalen]essenz.

II. THE SWEET ORANGE.

Citrus Aurantium Risso (*C. Aurantium* var. *β dulcis* L. *C. dulcis* Lk.) *Habitat* : Northern India and South. China. Cultivated in most warm climates. Brought by the Portuguese, about 1548,

⁶ The terms *orangeat* and *citronnat*, which denote a sweetmeat, must not be confounded with *orangeade* and *citronade*, which, like *lemonade*, denote beverages.

⁷ Both processes are well-described in the *Pharmacographia*, pp. 106-107. The *écuelle* is a tinned copper bowl, having concentric rows of spikes on its flat bottom, and a hollow handle with a gutter from it to the edge of the bowl, which serves for emptying the collected oil. The fruits are rolled about on the spikes, and in consequence of the puncturing of the oil cells, the oil escapes. A full description and illustration was published in the April number of NEW REMEDIES, pg. 104.

from South. China to Europe. The first tree stood long at Lisbon in the house of the Count of St. Laurent. Thence it went first to Rome, then extended along the Mediterranean, deep into Western Asia, and to other parts of the globe.

Engl. : Sweet orange-tree. Portugal orange-tree. *Fr.* : Oranger. *Germ.* : Apfelsinenbaum. Süßer Pomeranzenbaum. Orangenbaum. *Ital.* : Arancio dolce. Melarancio. *Span.* : Naranjo (dulce). *Port.* : Laranjeira de fructo doce.

The Leaves (18) have formerly been used, like the bitter, as a remedy in spasmodic diseases.

Lat. : Folia Aurantii dulcis. *Engl.* : Sweet orange leaves. *Fr.* : Feuilles d'oranger, etc.

They yield in part :

Essence de Petit Grain (19 ; see 2 and 11).

The Flowers (20). The dried flowers are used, in infusion, as a gentle nervous stimulant. The Chinese use the fresh flowers to scent certain varieties of teas.

Lat. : Aurantii flores (in the U. S., Br., and Germ. Ph., denote both the bitter and the sweet.)

Candied Orange Flowers (21) are prepared by depriving orange flowers of their cups, stamens, and pistils ; mixing them with sugar in the proportion of two lbs. of the latter to four ounces of flowers, boiling them to a candy height, and pouring out on a slab to form a cake. Stomachic and antispasmodic.

Lat. : Flores Aurantii conditi.

Essential Oil (22). This is less fragrant than that obtained from the flowers of the bitter or-

ange; and is used as a substitute or addition to oil of néroli.

The statement, which is often met with, that the Essence de Néroli Bigarade is prepared from the flowers of the bitter, and Essence de Néroli Pétale from those of the sweet orange, is not founded on fact; except, perhaps, in the case of the Essence de Néroli de Paris (see 7).

The Unripe Fruit (23) is used for the same purposes as unripe bitter oranges (see 9). The issue-peas of the shops are usually made of these berries.

The Ripe Fruit (24). Among the many varieties of sweet oranges, the following are esteemed as the best:

The *Chinese* or *Mandarin* orange, the fruit of the two varieties *Citrus Chinensis* and *Citrus myrtifolius*. This has a dark reddish-yellow peel, and a blood-red pulp. It was introduced in the first part of this century into Sicily and into Malta, and hence is often called *Maltese* orange. From there it has been transplanted to the Azores and other places. This kind of oranges are called *tangerines* at St. Michaels.

East Indian small clove oranges. The rind of this, together with a small quantity of the rind of the coarser "country" orange, is used for preparing a superior orange marmalade.

The "navel oranges" of *Bahia* are celebrated for their extraordinary fine flavor.

Sicily oranges, exported from Messina and Palermo.

Spanish oranges, from Sevilla, Valencia, and the Island of Majorca.

Portugal oranges, the best of which come from St. Michaels in the Azores.

Italian oranges, from Calabria (Reggio), Naples, Sorrento, and Genoa.

French oranges from the Provence; those of the smallest size are called *mignonettes*.

West Indian and *Florida* oranges. The Havana and St. Augustine are considered the best.

The *Cape of Good Hope* produces very fine oranges, and the trees have attained there a very large size.

Lat. : Fructus Aurantii dulcis. *Engl.* : Sweet, or Portugal,⁸ or China orange. *Fr.* : Orange (douce). *Germ.* : Apfelsine. Süsser Pomeranze. Orange. Sinaapfel. *Ital.* : Arancia (dolce). Melarancia. Poma de Sino. *Span.* : Naranja (de la China). *Port.* : Laranja doce, or da China.

The *Peel* (24) of the ripe fruit has a golden yellow or orange-yellow color externally, a thinner, less spongy white layer internally, and a peculiar faintly bitter taste. (On the *Commercial Peel* see above, pg. 9.

Lat. : Cortex Aurantii dulcis. *Germ.* : Apfelsinenschalen, etc.

Candied Orange Peel (25) is made like candied bitter orange peel (see 15).

Lat. : Cortex Aurantii (or Aurantium) conditus.

The *Juice* (26) of the ripe fruit is a grateful beverage. Mixed with common salt it is used as a purge in the West Indies.

Essence de Portugal (27) is the essential oil obtained from the rind of the scarcely ripe fruit by mechanical means, either by the sponge or écuelle process.

⁸ From the Portuguese, who first brought the fruit to Europe, it soon acquired the name *portogallo* (Italian), *πορτογαλέα* (Med.-Greek), *protokale* (Albanian), and even Kurdish *portoghal*.

Engl. : Oil of Portugal. *Germ.* : Süsse Pomeranzen-
(schalen)essenz.

The commercial oil is often a mixture of various oils of different origin, from the Citrus family.

Essence de Mandarine (28), a very finely-flavored yellowish oil, is obtained, by expression, from the rind of the Mandarine or Maltese orange. It is, however, very rarely to be obtained in the market.

III. THE LEMON.

Citrus Limonum Risso (*C. medica* var. β L.).
Habitat. : Northern India : Valleys of Kumaon and Sikkin. Brought to Palestine and Egypt by the Arabs about the tenth century. The tree flowers and bears fruit all the year round. Three harvests are generally obtained ; the best in the middle of May ; in other localities from July to September. *Cultivated* along the Mediterranean coast (South. France, Italy, Greek islands, North. Africa), in Spain, Portugal, South. and West. Asia, the West Indies, Brazil, etc.

Engl. : Lemon-tree⁹. *Fr.* : Limonier. Citre-Limo-

⁹ *Lemon* is from the Arabic *limūn*, and this, by way of the Persian, is related to the Hindu *limu*, *limbu* or *nimbu*. Adam already in his *Hindī-Kosha* (Calcutta, 1829) translates the Sanskrit *nimbu* into Hindī *limu*. This translation is no doubt correct ; but the Sanskrit has evidently coined or adopted the word from the North Indian vernaculars. In Cashmeer it is still called *nimbu*. There are many names in Sanskrit for the Citrus-fruits, a number of them standing for lemon. The *Malabar* *inoda* (see above, note 2) mentions two kinds of *nimbu* (or *nimbūka*), one of which is sour, and the other sweet. Another native term is *nishu*, according to the *Sabdarūpaṭra*. The Medio-Greek is λαμόριον, λεμόρη. The lem-

nier. *Germ.* : Citronenbaum (incorrectly but commonly so called. Less usually: Limonenbaum). *Ital.* : Limone. *Span.* : Limonero. *Port.* : Limoeiro.

The Bark of the Root (29) has been used in the West Indies as a febrifuge.

The Fruit (30). This is usually gathered before fully ripe. The best comes from Messina in Sicily; from the Riviera of Genoa,¹ chiefly about St. Remo; from Nizza and Mentone; also from the Garda Lake; from Malaga and Lisbon.

Lat. : Fructus Limonis. *Limonia malus (acida)*. *Limon*es (plur.). *Citrea* (plur.). *Engl.* : Lemon. *Fr.* : Citron (less correctly; better:) Limon. *Ital.* : Limone. *Span.* : Limon. *Germ.* : Citrone (incorrectly but commonly so called. Seldom :) Limone.

The Seeds (31) have been used as a vermifuge.

The Peel (32) of the fruit contains much essential oil. A good deal of the commercial lemon-peel is derived from *Citrus medica*. In pharmacy the rind of the *fresh* lemon should be used.

Lat. : Limonis cortex. *Limonium cortex*. *Cortex* (fructus) *Citri*. *Pericarpium Citri*. *Engl.* : Lemon-peel. *Fr.* : Ecorces or zestes de citrons (limons). *Germ.* : Citronenschale (Limonenschale), etc.

Candied Lemon Peel (33) is prepared like candied bitter orange peel (see 15). Used as a sweetmeat.

Lat. : Cortex Limonis conditus.

on is first mentioned in the book on Nabathean Agriculture under the name *hasia* (see *Meyer, Gesch. d. Bot.*, III., 68).

¹⁰ The strip of land around the Gulf of Genoa, from Spezzia (Italy) to Nizza or Nice (France).

Juice of Fruit (34), or lemon-juice. For medical purposes this should be expressed from fresh lemons. The fruit is peeled, the seeds are removed (as they would make the product bitter and mucilaginous), the pulp is cut, mixed with clean chaff, and pressed in strong cloths. When the juice has cleared, it is filtered, filled into small bottles, which are loosely corked, and immersed for a while in boiling water. The cork is then inserted tightly, waxed over, and the bottles preserved in a cool place.

Concentrated Lemon Juice or *Lime Juice* (35) is exported for making citric acid. It is obtained promiscuously from the lemon, the lime, and the bergamot.

Essential Oil of Lemon. This is either produced by mechanical means, from rather green and unripe lemons, and such which it would not pay to export, owing to their small or irregular size by the *sponge-process*, at Messina and Palermo in Sicily, and at Reggio in Calabria. This constitutes the *Essence de Citron à l'éponge* (36). Or,

by the *écuelle-process*, at Mentone and Nice (South. France). This constitutes the *Essence de Citron au zeste* (37).

Or else by distillation, for which the rind of damaged fruits, as well as the residue left from either of the above-mentioned manipulations are used. This is the *Essence de Citron distillée* (38).

Lat. : Oleum Limonis. Oleum Citri. Oleum de Cedro.
Engl. : Oil of lemon. *Germ.* : Citronenessenz, etc.
 Most of the commercial oil contains *distilled* oil of lemon, or else oil of turpentine.

IV. THE LIME.

Citrus Limetta Risso (*C. medica* var. γ L.)

Engl.: Lime-tree. Limetta-tree. *Fr.*: Limettier.
Germ.: Limette. Limettenbaum.

The Fruit (39) is pale yellow, oval or globular. According to Risso, this is the Adam's apple (*Pomo d'Adamo*) of the Italians.

Engl.: Lime, Limetta. *Fr.* and *Germ.*: Limette, Lime. *Ital.*: Lime.

The Juice (40) of the fruit is very acid, even acrid. The fresh juice is sometimes used to acidulate spirituous drinks, or for cleaning floors, scenting rooms, etc.

Lime Juice (41, see 35) or concentrated lemon juice, exported for making citric acid, is partly obtained from it.

Essence de Limette (42). Oil of Limetta is obtained from the rind of the fruit. It very much resembles oil of lemon.

V. THE BERGAMOT.

Citrus Bergamia var. *vulgaris* Risso et Poiteau. This species is not known to exist in a wild state. It is cultivated in Greece, Spain, South France, and Sicily, but chiefly about Reggio in Calabria.

Engl.: Bergamot-tree.¹¹ Lime-Bergamot-tree. *Fr.*: Bergamottier. *Germ.*: Bergamottenbaum. *Span.*: Bergamoto or Bergamote. *Ital.*: Bergamotto.

The Leaves (43). An essential oil is distilled from these, which is used for adulterating oil of Bergamot.

¹¹ *Bergamot* is a corruption of the Turkish *beg-armudi*, "prince's pear."

The Flowers (44). An essential oil is said¹² to be made from these ; but we can find no mention of it in any commercial reports or other reliable sources of information.

The Fruit (45) is round or pear-shaped, of a pale golden color, $2\frac{1}{2}$ - 3 inches in diameter, with a pale yellow pulp.

Engl. : Bergamot. *Fr.* : Bergamotte. *Germ.* : Bergamotte. Bergamotten-Orange. *Span.* : Bergamota. *Ital.* : Bergamotta.

The Juice (46) of the fruit constitutes a portion of the commercial concentrated lime juice (see 35).

Essence de Bergamotte (47) is prepared by a mechanical process¹³ in small quantities, in Greece, Southern France, and Spain. But the commercial oil is almost entirely obtained from bergamots grown about Reggio, and is exported from Messina and Palermo.

Engl. : Oil of Bergamot. *Fr.* : Essence de (or à la) Bergamotte. *Germ.* : Bergamottöl, etc.

Here may also be mentioned :

Citrus Limonum var. *Bignetta* Risso. The Bignette-tree. *Fr.* : Vignette.

The Fruit (48) has a yellowish rind ; is globular, and has a depression below the blunt navel.

Citrus Lumia Risso et Poit. The sweet lemon. *Lumia*.

Fr. and *Germ.* : Lumie.

The Fruit (49) is oblong ; has a bright yellow rind with a curved navel, and a sweet pulp.

¹² *Treasury of Botany*, I., 292.

¹³ See *Pharmacographia*, p. 109.

The Essential Oil (50), Oil of Lumia, Essence de Lumie, is prepared at Squillace in Calabria by mechanical means.

VI. THE CITRON.

Citrus medica Risso (*C. medica* var. α L., *C. Cedra* Gall.). *Habitat*: Northern India. Cultivated chiefly in Sicily and Corsica; also in other parts of Italy, in Spain, Portugal, the West Indies, Brazil, etc. This is the only species of *Citrus* which was known to the ancients.¹⁴

¹⁴ The Median apple, *μῆλον Μηδικόν*, was synonymous with *κεδρόμηλον* (later translated into *citrium malum*) *μῆλον Περσικόν* "Persian apple," *Malus Assyria* (Plin.), and perhaps with *μῆλα Ἑσπερίδων*, "apples of the Hesperides" (the mythical daughters of Hesperus, who were supposed to reside at the furthest confines of the earth, where they guarded the golden apples. These are, however, by some authorities, held to designate a species of *guince*). The old name *κεδρόμηλον*, which was used by Dioscorides (ab. 50 A.D.), and for which the Romans, as he adds, used the term *κίτριά* (= *citria*), had already become obsolete in Galen's time (ab. 170 A.D.). Simeon Seth calls them *κίτρα*, and, according to one MS., *μῆλα Ἰνδικά*, "Indian apples." The Latin term *citrus* was applied both to the citron tree, and by confusion with the word *cedrus*, also to *Thuja orientalis*. The mediævo-Latin terms are: *citria*, *citrea*, *citromela*, *citrangula* (*Monardes*), *melangula* (*Cæsalpinus*). *Citrangula*, however, was also applied to lemons and oranges (so by the commentators to Mesue's *Antidotarium*, Ven. fol., 1543, in the chapter on the "*oleum e pomis citrangulis*.").—The derivation of the word *Citrus* is doubtful. Zehetmayr (*Lex. etymol.*, p. 50) refers it to Sansk., *brihat-chitta* ("large-minded"!), which, according to native glossaries, is a name of the fruit. This is, of course, bungling. If it is an Indian word, it is probably simply *chitra*, "excellent, variegated, wonderful," which is also the name of various other plants. Possibly it is Indianized from the Chinese. The oldest Chinese

Lat. : Citrea (*sc. arbor*). Citrus, Citrea (*or citria*) malus.
Gr. : κίτρεα, κίτρία. *Eng.* : Citron-tree, Cedrat-tree.
Fr. : Citronnier, Cedratier. *Ital.* : Cedrato, Cedro.
Span. : Cidro. *Port.* : Cidreira. *Germ.* : Cedraten,
 Citronenbaum.

The Fruit (51) is generally large, and often attains an extraordinary size, weighing sometimes as much as 20 and even 30 pounds. The whole fruit is often exported salted. There is a curious Chinese variety (*Citrus sarcodactylus*), which ends in five or more long finger-like lobes, known as Buddah's Citron.¹⁵

Lat. : Citreum, Malum Citreum. *Gr.* : κίτρον, κίτριον, κίτρομηλον. *Fr.* : Cedrat. *Germ.* : Cedra'en-Citron. *Span.* and *Port.* : Cidra.

Adam's Apple (52). Both the fruit of *Citrus medica* and of *Citrus Pomum Adami* Risso have received the name of Adam's apple, sometimes wrongly called paradise-apple. The fruit of the latter is by some described as having near the navel a mark resembling a cicatriced bite.

According to the belief of the Jews,¹⁶ this is the fruit which Adam tasted contrary to God's command in the Garden of Eden. Hence, it is used during the Feast of Tabernacles to embellish the huts, and as an ornament for

term, occurring already in the Shu-king (about 800 B. Ch.; see *Bretschneider, On the Study, etc., of Chinese Botanical Works*, p. 11), is *kü* (-*kiuh*); this word, in passing into the Indian languages, may have received the very common noun-affix *tra*, and thereby have become *chitra*.

¹⁵ *Fou-shan-kan*, "Buddah's head."

¹⁶ The Talmudic name of the Adam's apple is *ethrog* or *ethrunga* אֶתְרוֹג, אֶתְרוֹנָה, which, like the Persian *torunch*; Kurd., *torunch*; mediaevo-Greek *τερονάτζ*, *τοννάτζ*, and the Arab. *utruch* or *utrâch* (Avicenna; Ibn Baithar) is a corruption of *ndrandj*, "ora ige."

the table. Various large varieties of citron are used for this purpose, but many orthodox Jews in Italy and Germany only use the fruit grown in Corfu, South Italy, and Sicily, which is packed in boxes holding 20-25 fruits, together with young leaves of the date-palm, and accompanied by a certificate of the chief rabbi of the place, that it is genuine and correctly gathered.

The Adam's apple (*Pomme d'Adam*) of the Paris shops (44) is different from the above, being a variety of eatable sweet orange. The Adam's apple of the Italians (45) is, according to Risso, the fruit of *Citrus Limetta*.

Candied Citron, whole (53). The large whole candied fruits, 8-9 inches long, which are occasionally found in the market, are called *Poncires* or *Poncines*.¹⁷

The Peel (54) constitutes a large proportion of the commercial lemon-peel (see 32).

The Candied Peel (55) appears in the market in two forms. It is first soaked in salt water, then scalded, and boiled in syrup. When put in casks with the syrup, it constitutes the *Citronnat* (56). When previously dried, it is called *Succat* or *Succade* (57).

Lat. : Cortex Citri conditus. *Germ.* : Citronat, Citronate, Cedrat.

Essence de Cedrat (58) or Oil of Cedrat may be obtained from the rind of the fruit, best by the sponge-process. But it is not known to be made anywhere; and what there is in the market, is, for the most part, or altogether fictitious.

It is said that the essential oil of citron or cedrat is some-

¹⁷ Supposed to be a contraction of the words "*pomum citri*." It was already in use before Bauhin's time (see his *Pinax Theatr. Bot.*, p. 435).

times used as a sophistication or substitution for oil of lemon.

VII. THE SHADDOCK.

Citrus Pompelmos Risso, (*C. decumana* L.)
Habitat: China and Japan; from thence it extended to the Indian Archipelago and to Mauritius. It may also have been indigenous to Tahiti; for Captain Cook already found it there. Cultivated in South. Asia, Europe, and America.

The Fruit (59) weighs up to 12 pounds; is round or pear-shaped, sometimes flattened; has a smooth thick peel, containing ethereal oil, and a juicy agreeable sweetish-sour pulp. This is eaten, and recommended in the tropics particularly in diseases of acclimatization. The largest fruits are called *Pompelmousses* (60). Those of the smallest size constitute the *Forbidden Fruit* (61) of the English markets, particularly in the West Indies.

Engl.: Shaddock,¹⁸ Pumelo,¹⁹ Pompelmos (or -mousse), Paradise-apple, West or East India orange. *Fr.*: Pompoléon, Pampelmousse, Pamplémousse. *Germ.*: Pampelmus, Pumpelmus.

¹⁸ So called after Captain Shaddock, who first brought it from China to the West Indies early in the 18th century.

¹⁹ Pumelo is a contraction of "pomum melo" *melon-apple*.